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Indian Standard

SPECIFICATION FOR INK, MARKING, FOR NON-POROUS SURFACES (WITH OR WITHOUT STENCIL PLATE)

(First Revision)

UDC 667·526·2·019·2 : 620·113

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *December* 1985

Indian Standard

SPECIFICATION FOR INK, MARKING, FOR NON-POROUS SURFACES (WITH OR WITHOUT STENCIL PLATE)

(First Revision)

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Indian Standard

SPECIFICATION FOR INK, MARKING, FOR NON-POROUS SURFACES (WITH OR WITHOUT STENCIL PLATE)

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 4 March 1985, after the draft finalized by the Inks and Allied Products Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard was originally issued in 1959 and covered oil based stencil inks. Since solvent based inks are also now being used for stencilling purpose, the Sectional Committee responsible for the preparation of this standard decided to revise it incorporating the requirements of solvent based inks also.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements and the methods of sampling and test for stencilling ink used for marking letters or figures with or without stencil plate on to a non-porous surface, such as metal, glass, plastics, porcelain or enamel with the help of a brush or fountain marker.

1.1.1 This standard does not cover inks which are applied by rubber stamps or rollers on non-porous surfaces.

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*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in IS : 4395-1967* and IS : 4724-1968† shall apply.

3. TYPES

3.1 The material shall be of the following two types:

Type 1 — oil based; and

Type 2 — solvent based.

4. REQUIREMENTS

4.1 Description

4.1.1 The material shall consist of a dispersion of pigment or a solution of dye in a suitable oil or solvent base vehicle. It shall be free from foreign matters and visible impurities.

4.1.2 The material shall be suitable for application by fountain brush and stencil board, stencil brush and stencil board or by fountain marker. It shall be free from any materials which have a deleterious effect on the tools.

4.1.3 The material shall dry to produce uniform and legible markings of flat or egg-shell gloss.

4.2 Colour — The colour of the material shall be as agreed to between the purchaser and the supplier.

4.3 Stability — The material as received, if separated, shall be readily mixed by simple stirring. On allowing about 500 ml of the material to stand in a 1 000 ml beaker at 5° and 50°C for 12 hours respectively, neither settling of pigments nor any other separation shall take place; and there shall also be no skinning, thickening or curdling.

4.4 Freedom from Toxic and Noxious Materials — It shall be free from benzene, chlorinated compounds, aniline oils and any other noxious or toxic materials when tested by the methods prescribed in Appendix A.

4.5 Drying Time — The material shall dry in not more than 15 minutes when tested by the method prescribed in Appendix B.

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*Glossary of terms relating to inks and allied industries.

†Glossary of terms relating to printing inks and allied industries.

4.6 Hiding Power — The material shall hide the contrasting surface completely when applied at the rate of one litre per eight square metres and tested as prescribed in Appendix C.

4.7 Residue on Sieve — The material, when sieved through 850-micron IS Sieve [*see* IS : 460 (Part 1)-1978*] by the method prescribed under **13** of IS : 101-1964† shall not leave a residue of more than 8 percent by mass of the material.

4.8 Non-Volatile Vehicle — The non-volatile portion of the vehicle shall be not less than 20 percent by mass of the vehicle, when tested by the method prescribed under **27** of IS: 101-1964†.

4.9 Miscibility with Petroleum Spirit — The material, when mixed with an equal volume of petroleum spirit (BP 50 to 60°C) shall not produce any precipitate or curdling.

4.10 Accelerated Weathering — The material, when tested as prescribed in Appendix D, shall withstand 24-hours cycles of accelerated weathering without cracking, peeling or flaking, and at the end of the period shall show not more than slight chalking or change of colour.

4.11 Effect on Stencil Brushes — The stencil brush shall remain clean and free from hard to gummy deposit when tested as prescribed in Appendix E.

4.12 Application — The material shall pass the test prescribed in Appendix F.

4.13 Flash Point (Abel) — The flash point shall be not below 30°C when tested by the method prescribed under **24** of IS : 101-1964†.

4.14 Keeping Quality — The material shall retain its properties for at least one year from the date of manufacture.

5. PACKING AND MARKING

5.1 Packing — The material shall be packed in suitable containers as agreed to between the purchaser and the supplier.

5.2 Marking — The containers shall be securely closed and marked with the following information:

a) Name and type of the material;

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*Specification for test sieves: Part 1 Wire cloth test sieves (*second revision*).

†Methods of test for ready mixed paints and enamels (*second revision*).

b) Manufacturer's name and/or his recognized trade-mark, if any;

c) Volume of the material;

d) Month and year of packing; and

e) Identification mark in code or otherwise, to enable the lot of manufacture to be traced back from records.

5.2.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. SAMPLING

6.1 Representative test samples of the material shall be drawn as prescribed in **3** of IS : 101-1964*.

6.2 Number of Tests — Tests for all the requirements given in **4** shall be conducted on the composite sample.

6.3 Criteria for Conformity — The lot shall be declared as conforming to the requirements of the specification if all the test results on the composite sample satisfy the relevant specification requirements.

7. TEST METHODS

7.1 Tests shall be carried out by the methods prescribed in Appendices A to F.

7.2 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977†) should be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

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*Methods of test for ready mixed paints and enamels (*second revision*).

†Specification for water for general laboratory use (*second revision*).

APPENDIX A

(*Clause* 4.4)

TEST FOR TOXIC OR NOXIOUS MATERIALS

A-1. TEST FOR BENZENE

A-1.1 Reagents

A-1.1.1 *Concentrated Sulphuric Acid* — *See* IS : 266-1977*.

A-1.1.2 *Orthophosphoric Acid* — about 85 percent by mass.

A-1.1.3 *Acid Mixture* — Mix 170 ml of orthophosphoric acid with 100 ml of concentrated sulphuric acid.

A-1.1.4 *Concentrated Nitric Acid* — *See* IS : 264-1976†.

A-1.1.5 *Dimethyl Sulphate*

CAUTION — Care shall be taken in handling dimethyl sulphate as it is poisonous. Its fumes produce violent inflammation of the larynx, bronchial tubes and eyes, and the liquid produces blisters and bad sores on the skin.

A-1.2 Procedure

A-1.2.1 Place 150 ml of the material in a distillation flask, add 150 ml of water, and distil the mixture slowly, avoiding overheating of the material. Collect the fraction (*A*) distilling up to 80°C. Continue the distillation and collect another 60 ml (*B*), of the non-aqueous liquid in a separate receiver.

A-1.2.2 Shake fraction (*A*) with its own volume of acid mixture in a separating funnel. If there are two layers, retain the upper layer. If there is no separation of layers, discard the whole fraction. Treat the fraction (*B*) similarly. Mix the upper layers from (*A*) and (*B*), wash with water and dry, first over calcium chloride and then over potassium hydroxide. Distill the liquid through a fractionating column. Collect the fraction distilling between 75 and 85°C.

A-1.2.3 If there is no distillate below 85°C, benzene shall be taken to be absent. If there is distillate between 75 and 85°C, identify it by

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*Specification for sulphuric acid (*second revision*).

†Specification for nitric acid (*second revision*).

odour, refractive index (refractive index of benzene is 1·502 at 30°C) or by the procedure given under **A-1.2.4**.

A-1.2.4 Mix 10 ml of the distillate obtained between 75 and 85°C (*see* **A-1.2.2**) with 20 ml of dimethyl sulphate. Remove the upper layer and distill the lower layer up to 125°C. Add 3 drops of this distillate to a mixture of one millilitre of concentrated nitric acid and one millilitre of concentrated sulphuric acid contained in a test tube and boil for 30 seconds. After cooling, add 10 ml of water. A flocculent precipitate of *m*-dinitro benzene of odour of nitro-benzene confirms the presence of benzene. Filter off the precipitate, recrystallize from 8 ml of alcohol (50 percent by volume) and determine the melting point. The melting point of *m*-dinitro benzene is 89 to 90°C.

NOTE — Toulene does not give either of these indications, but forms a heavy oil.

A-2. TEST FOR CHLORINATED COMPOUNDS

A-2.1 Procedure — Steam distil 100 ml of the material, using a receiver cooled in ice. Separate, the lower layer of the distillate, dry and redistil. Collect the fraction boiling between 60 and 100°C. Wash the fraction with several volumes of water and determine the specific gravity boiling range of the residual liquid.

A-2.1.1 The material shall be regarded as free from undesirable chlorine compounds if the specific gravity is not more than 1·2 at 15/15°C and the boiling point is not above 60°C

A-3. TEST FOR ANILINE OIL

A-3.1 Reagents

A-3.1.1 *Dilute Hydrochloric Acid* — 1 : 4 by volume.

A-3.1.2 *Concentrated Sulphuric Acid* — *See* IS : 266-1977*.

A-3.1.3 *Ether* — *See* IS : 336-1973†.

A-3.1.4 *Manganese Dioxide*

A-3.2 Procedure — Separate the vehicle from the pigment by extraction as prescribed under **27.1** of IS : 101-1964‡. Distil off the solvent from conical flask and heat the flask to constant mass in a

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*Specification for sulphuric acid (*second revision*).

†Specification for ether (*second revision*).

‡Methods of test for ready mixed paints and enamels (*second revision*).

vacuum oven or in a non-oxidizing atmosphere at a temperature of 100 ± 2°C. Allow to cool. Dissolve 5 to 10 ml of the resulting vehicle in about 50 ml of ether and extract with 25 ml of dilute hydrochloric acid. Wash the hydrochloric acid extract, which contains the aniline oils, if any, a few times with 10 ml portions of ether and then evaporate to small volume. To a small portion of the evaporated residue, add a few drops of concentrate sulphuric acid and a small quantity of manganese dioxide.

A-3.2.1 The material shall be taken as free from aniline oil if no blue or greenish blue colour develops.

APPENDIX B

(*Clause* 4.5)

DETERMINATION OF DRYING TIME

B-1. PROCEDURE

B-1.1 Stencil a number of letters about 20 mm high by means of a stencil brush and stencil board on to a clean glass panel (*see* **5.3** of IS : 101-1964*) using the material under test. Apply the material just sufficient to make legible opaque letters without smearing. Let them stand for 15 minutes.

B-1.1.1 The material shall be considered to have passed the test if rubbing with a finger under moderate pressure, does not pick up smudge or smear the stencilled letters.

APPENDIX C

(*Clause* 4.6)

TEST FOR HIDING POWER

C-1. APPARATUS

C-1.1 Pfund Cryptometer — The cryptometer as shown in Fig. 1 consists of the following parts.

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*Methods of test for ready mixed paints and enamels (*second revision*).

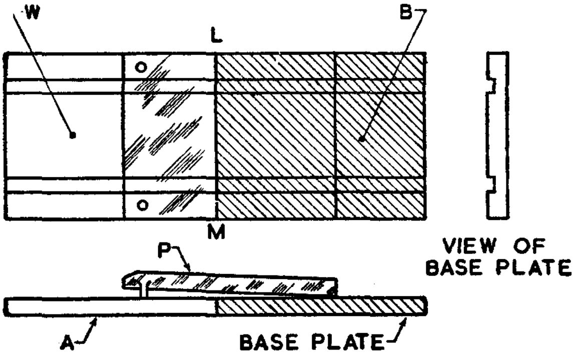

Fig. 1 Black and White Cryptometer

C-1.1.1 *Base Plate* — (*A* in Fig. 1) It consists of two glass plates, black (*B*) and white (*W*) fused together along the line *LM*.

The reflection coefficients for the white and black parts of the base plate are 80·5 percent and less than 5 percent, respectively. Along the two longer edges and perpendicular to the line *LM*, there are tow parallel shallow grooves. In the blank as well as white glass plate there are two millimetre scales along the grooves with '*O*' graduation at the dividing line *LM* between the black and white halves. The upper surface of the base plate of both black and white glass is optically flat.

C-1.1.2 *Top Plate* — (*P* in Fig. 1) It is made of clear glass with its lower surface optically flat. When placed on the base plate, the lower side of the top plate facing the base plate has two small steel legs which form a wedge-shaped film of the ink between the base and the top plates. Two top plates with different wedge angle, constants are supplied for use with : (a) black and dark inks, and (b) white and light coloured inks.

C-2. PROCEDURE

C-2.1 Place a few drops of the ink sufficient to fill the wedge-shaped, clearance between the base plate and the top plate along the dividing line *LM* between the black and white halves of the base plate. Carefully place the top plate on the ink eliminating bubbles. Gradaully draw the top plate along the length of the base plate so that dividing line just disappears. Note the scale reading at the point of contact with the top plate. Then move the top plate in the opposite direction till the line of demarcation re-appears. Again record the scale to reading at the point of contact with the top plate. Repeat the experiment ten times and calculate the mean for ten pairs of observations (that is 20 readings) for disappearance and reappearance of the dividing the line *LM* of the black and white halves.

C-3. CALCULATION

C-3.1 Hiding Power per Litre $= \frac{1}{KL}$ m^2

where

K = wedge angle constant engraved on the top plate, and

L = mean scale reading.

APPENDIX D

(*Clause* 4.10)

ACCELERATED WEATHERING TEST

D-1. APPARATUS

D-1.1 Accelerated Weathering Machine — The machine shall have a glass enclosed carbon arc lamp and a water spray. The glass surrounding the arc shall be such as will tramsmit radiation down to 2 755 mn. It shall also have the following characteristics:

a) *Type of Current* — 50 cycles ac.

b) *Line Voltages* — 208 to 250 volts (preferably 220 volts).

c) *Arc Voltage* — 125 to 140 volts.

d) *Current* — 15 to 17 amperes.

e) *Upper Electrode* — 305 × 13 mm (cored or solid carbon rod).

f) *Lower Electrode* — 102 × 13 mm (cored or solid carbon rod).

D-1.2 Panels — as prescribed under **5.3** of IS : 101-1964*.

D-2. PROCEDURE

D-2.1 Stencil four or five letters about 20 mm high on to three panels using a stencil brush and stencil board and apply enough material to give clear legible letters without smearing. Allow the lettered panels to

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*Methods of test for ready mixed paints and enamels (*second revision*).

dry for 24 hours at 27 ± 2°C in a well ventilated room free from draft, dust, smoke or fumes. After this time, place two of the panels at 40 ± 2·5 cm from the arc, keeping the third panel for comparison. Do not permit the temperature at the surface of the panels to exceed 60°C and the temperature of the water in line where it enters the apparatus shall be at 25 ± 5°C. Examine the letters after exposing the panels to weathering cycles of 8 hours light, 10 hours light with water spray and 6 hours water spray.

D-2.2 After the exposure, examine the lettering on the panels for cracking, flaking, peeling and change of colour.

APPENDIX E

(*Clause* 4.11)

TEST FOR EFFECT ON STENCIL BRUSHES

E-1. REAGENT

E-1.1 White Spirit — *See* IS : 1745-1978*.

E-2. PROCEDURE

E-2.1 Wet a stencil brush thoroughly with the material, allow the excess ink to drain off and then let the brush stand for 18 hours on its side, so that the bristles do not touch an absorbent surface. Immerse the brush in white spirit for 15 minutes, then rinse in white spirit, dry and examine.

E-2.2 The material shall be taken to have passed the test if the brush remains clean and free from hard and gummy deposit.

APPENDIX F

(*Clause* 4.12)

DETERMINATION OF APPLICABILITY

F-1. PROCEDURE

F-1.1 Apply the material to a mild steel panel (*see* **5.2** of IS : 101-1964†) by means of fountain brush and stencil board or by stencil brush and stencil board for by a fountain marker.

F-1.2 The material shall be considered satisfactory if clear, legible and opaque letters are formed without smearing and the material is satisfactorily retained without dripping.

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*Specification for petroleum hydrocarbon solvents (*second revision*).

†Methods of test for ready mixed paints and enamels (*second revision*).

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Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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